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THE INFLUENCE OF COASTAL FRONTS ON THE
MOVEMENT AND DISPERSION OF OIL SLICKS

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SIGNIFICANT RESULTS

LANDSAT, aircraft and boats have been used successfully to study estuarine and coastal fronts or boundaries. Fronts (regions of high horizontal density gradient with associated horizontal convergence) are a major hydrographic feature in Delaware Bay and in other estuaries. Horizontal salinity gradients of 4‰ in one meter and convergence velocities of the order of 0.1 m/sec. have been observed. Visibility improved from one meter to two meters as certain boundaries were crossed. Fronts near the mouth of the bay are associated with the tidal exchange with shelf water. The formation of fronts in the interior of the bay appears to be associated with velocity shears induced by differences in bottom topography with horizontal density difference in the deep water portion of the estuary. Surface slicks and foam collected at frontal convergence zones near boundaries were found to contain concentrations of Cr, Cu, Fe, Hg, Pb, and Zn higher by two to four orders of magnitude than concentrations in mean ocean water.

By capturing and holding oil slicks, these frontal systems also significantly influence the movement and dispersion of oil slicks in Delaware Bay. Recent oil slick tracking experiments conducted to verify a predictive oil dispersion and movement model have shown that during certain parts of the tidal cycle the oil slicks tend to line up along boundaries. Thus, unexpected oil slick distribution patterns result which even for a known oil type cannot be predicted on the basis of wind and tidal current information alone.